Decision Rationale

Total Maximum Daily Loads for
the Primary Contact (Bacteriological) and Aquatic Life Use Impairments on Crab Creek

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited water body.

This document will set forth the Environmental Protection Agency's (EPA's) rationale for approving the TMDLs for the primary contact (bacteriological) and aquatic life use impairments on Crab Creek. EPA's rationale is based on the determination that the TMDLs meet the following eight regulatory conditions pursuant to 40 CFR §130.

1) The TMDLs are designed to implement applicable water quality standards.
2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.
3) The TMDLs consider the impacts of background pollutant contributions.
4) The TMDLs consider critical environmental conditions.
5) The TMDLs consider seasonal environmental variations.
6) The TMDLs include a margin of safety.
7) There is reasonable assurance that the TMDLs can be met.
8) The TMDLs have been subject to public participation.

II. Background

The Crab Creek Watershed is located in Montgomery County, Virginia. Crab Creek is a tributary to the New River. The bacteriological and benthic impairments on Crab Creek extends from the headwaters to its mouth, the confluence with the New River (12 miles). The 12,400-acre watershed is rural with forested and agricultural lands making up 33 and 48 percent of the watershed respectively. Residential and commercial lands make-up the remainder of the watershed.

In response to Section 303(d) of the CWA, the Virginia Department of Environmental Quality (VADEQ) listed 12 miles of Crab Creek (VAW-N18R) on Virginia's 1996 Section 303(d) list as being unable to attain the primary contact use and aquatic life use. The decision to list Crab Creek for these impairments was based on observed violations of the Commonwealth's

bacteriological criteria and assessments of the biological assemblage. At the time of its listing, the bacteria criteria used fecal coliform as an indicator species and had an instantaneous standard 1,000 colony forming units (cfu) per 100 milliliters (ml) and geometric mean standard of 200 cfu/100ml. This decision rationale will address the TMDLs for both impairments.

Fecal coliform is a bacterium which can be found within the intestinal tract of all warm blooded animals. Fecal coliform in itself is not a pathogenic organism. However, fecal coliform indicates the presence of fecal wastes and the potential for the existence of other pathogenic bacteria. The higher concentrations of fecal coliform indicate the elevated likelihood of increased pathogenic organisms.

EPA encouraged the states to use e-coli and enterococci as the indicator species instead of fecal coliform. A better correlation was drawn between the concentrations of e-coli and enterococci, and the incidence of gastrointestinal illness. The Commonwealth adopted e-coli and enterococci criteria in January 2003. According to the new criteria, streams will be evaluated via the e-coli and enterococci criteria after 12 samples have been collected using these indicator species. The fecal coliform criteria will be used in the interim. Twelve e-coli samples were collected from Crab Creek and it is therefore assessed according to the new criteria.

As Virginia designates all of its waters for primary contact, all waters are required to meet the bacteriological standard for primary contact. Virginia's standard applied to all streams designated as primary contact for all flows. The e-coli criteria requires a geometric mean concentration of 126 cfu/100ml of water with no sample exceeding 235 cfu/100 ml of water. Unlike the new fecal coliform criteria, which allows for a 10% violation rate, the new e-coli criteria requires the concentration of e-coli not exceed 235 cfu/100 ml of water.

Although the TMDL and criteria require the 235 cfu/100 ml of water concentration limit not be exceeded, waters are not placed on the Section 303(d) list if their violation rate does not exceed 10%. Therefore, Crab Creek may be deemed as attaining its primary contact use prior to the implementation of all of the TMDL reductions. It is necessary to keep this in mind because of the reductions required to attain the instantaneous criteria for e-coli in the model are extremely stringent.

To assess the biological integrity of a stream, Virginia uses EPA's Rapid Bioassessment Protocol II (RBPII) to determine status of a stream's benthic macroinvertebrate community.[1] This approach evaluates the benthic macroinvertebrate community between a monitoring site and its reference station. Measurements of the benthic community, called metrics, are used to identify differences between monitored and reference stations.[2] The state is currently in the

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[1]Tetra Tech 2002. Total Maximum Daily Load (TMDL) Development for Blacks Run and Cooks Creek. Fairfax, Virginia.

[2]Ibid 1

process of changing this methodology to a stream condition index (SCI) approach.

As part of the RBPII approach, reference stations are established on streams which are minimally impacted by humans and have a healthy benthic community. These reference stations represent the desired community for the monitored sites. Monitored sites are evaluated as non-impaired, slightly impaired, moderately impaired, or severely impaired based on a comparison of the biological community of the reference and monitored sites. Streams that are classified as moderately (after a confirmatory assessment) or severely impaired after an RBPII evaluation are classified as impaired and are placed on the Section 303(d) list of impaired waters. Crab Creek was assessed as moderately impaired.

The RBPII analysis assesses the health of the macroinvertebrate community of a stream. The analysis will inform the biologist if the stream's benthic community is impaired. However, it will not inform the biologist as to what is causing the degradation of the benthic community. Additional analysis is required to determine the pollutants which are causing the impairment. TMDL development requires the identification of impairment causes and the establishment of numeric endpoints that will allow for the attainment of designated uses and water quality criteria.[3] A reference watershed approach was used to determine the numeric endpoints for Crab Creek. Numeric endpoints represent the water quality goals that are to be achieved through the implementation of the TMDL which will allow the impaired water to attain its designated use. A reference watershed approach is based on selecting a non-impaired watershed that shares similar landuse, ecoregion, and geomorphological characteristics with the impaired watershed. The stream conditions and loadings in the reference stream are assumed to be the conditions needed for the impaired stream to attain standards.

Since the state is switching to the SCI for biological assessments, the TMDL modelers evaluated Crab Creek based on the SCI. Unlike the RBPII analysis, the SCI has a scoring system based on a statistical analysis of a large benthic database.[4] Therefore, the SCI does not evaluate the benthic community on a one to one basis but evaluates the monitored community against the condition of several nonimpaired waters at once. The results using the SCI method were similar to the findings using RBPII.

The TMDL submitted by Virginia is designed to determine the acceptable load of e-coli which can be delivered to the impaired segment, as demonstrated by the Hydrologic Simulation Program Fortran (HSPF), in order to ensure that the water quality standard is attained and maintained. HSPF is considered an appropriate model to analyze the impaired water because of its dynamic ability to simulate both watershed loading and receiving water quality over a wide range of conditions. The model was run to determine the fecal coliform loading to Crab Creek.

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[3] Ibid 1

[4] MapTech, 2004, General Standard Total Maximum Daily Load Development for Unnamed Tributary to Deep Creek.

A translator equation was used to convert fecal coliform results to E-coli.

The TMDL analysis allocates the application/deposition of fecal coliform to land based and instream sources. For land based sources, the HSPF model accounts for the buildup and washoff of pollutants from these areas. Buildup (accumulation) refers to all of the complex spectrum of dry-weather processes that deposit or remove (die-off) pollutants between storms.[5] Washoff is the removal of fecal coliform which occurs as a result of runoff associated with storm events. These two processes allow the model to determine the amount of fecal coliform from land based sources which is reaching the stream. Point sources and wastes deposited directly to the stream were treated as direct deposits. Wastes which are deposited directly to the stream do not need a transport mechanism.

Local rainfall and temperature data were needed to develop the model. Weather data provides the rainfall data which drives the TMDL model. Weather data was obtained from the NWS Station #446955 in Pulaski County for the bacteria TMDL and from the Blacksburg 3 SE weather station for the benthic TMDL.

Continuous stream flow data was not available for Crab Creek. Therefore, a paired watershed approach was used to develop the hydrology model for the bacteria TMDL. The model was calibrated to a gage on Upper Tinker Creek. The input parameters used for this model were then used as the basis for the Crab Creek hydrology model. The results of the Crab Creek hydrology model were compared to limited USGS data collected from station 03171170 (Crab Creek at STP near Christiansburg, Virginia). Flow data for this station was available from 1995 through 2003. The watershed was divided into five segments for the model. The bacteria loading model was calibrated and validated against observed data from the VADEQ monitoring stations within the Crab Creek Watershed.

The benthic TMDL was developed using the Generalized Watershed Loading Function model (GWLF). The GWLF model provides the ability to simulate runoff, sediment, and nutrient loadings from watersheds given variable source areas (e.g., agricultural, forested, and developed land).[6] GWLF is a continuous simulation model that uses daily time steps for weather data and water balance calculations.[7] Calculations are made for sediment based on daily water balance totals that are summed to give monthly values. A reference watershed approach was used to estimate the necessary load reduction needed to restore a healthy aquatic community and allow the streams in the Crab Creek watershed to achieve their designated uses. Toms Creek watershed in Montgomery County was selected as the reference watershed for Crab Creek. To equate the reference watershed with the monitored watersheds, the reference watershed was

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[5]CH2MHILL, 2000. Fecal Coliform TMDL Development for Cedar, Hall, Byers, and Hutton Creeks Virginia,

[6]Ibid 1

[7]Ibid 1

decreased in size to that of the impaired watershed in the model, the land uses were proportionally decreased based on the percent land use distribution. Therefore, the land use breakdown in the reference watershed remained constant.

Table 1 - Summarizes the Specific Elements of the TMDLs.

Segment	Parameter	TMDL	WLA	LA	MOS
Crab Creek	E-coli (cfu/yr)	1.27E+12	3.40E+08	1.27E+12	Implicit
Crab Creek	Sediment (T/yr)	2,551	77	2,219	255

The United States Fish and Wildlife Service has been provided with copy of these TMDLs.

III. Discussion of Regulatory Conditions

EPA finds that Virginia has provided sufficient information to meet all of the eight basic requirements for establishing a primary contact (bacteriological) and aquatic life (benthic) use impairment TMDLs for Crab Creek. EPA is therefore approving these TMDLs. EPA's approval is outlined according to the regulatory requirements listed below.

1) The TMDLs are designed to meet the applicable water quality standards.

Bacteria

Virginia has indicated that excessive levels of fecal coliform due to nonpoint sources (both wet weather and directly deposited nonpoint sources) have caused violations of the water quality criteria and designated uses on Crab Creek. The water quality criterion for fecal coliform was a geometric mean 200 cfu/100ml or an instantaneous standard of no more than 1,000 cfu/100ml. Two or more samples over a thirty-day period are required for the geometric mean standard. Since the state rarely collects more than one sample over a thirty-day period, most of the samples were measured against the instantaneous standard. Approximately 29 percent of the samples collected from the five monitoring stations on Crab Creek violated the old fecal coliform criteria. Based on the interim fecal coliform criteria the violation rate increases to 50 percent. Approximately 38 percent of the samples collected during TMDL development violated the new e-coli criteria.

The Commonwealth has changed its bacteriological criteria as indicated above. The new criteria require that the fecal coliform concentration not exceed a geometric mean of 200 cfu/100 ml of water for two or more samples collected over a month nor shall more than 10% of the total samples exceed 400 cfu/100 ml of water. The new e-coli criteria requires a geometric mean of 126 cfu/100ml of water with no sample exceeding 235 cfu/100 ml.

The HSPF model was used to determine the fecal coliform deposition rates to the land as well as loadings to the stream from direct deposit sources. Once the existing load was

determined, allocations were assigned to each source category to develop a loading pattern that would allow Crab Creek to support the e-coli water quality criterion and primary contact use. The following discussion is intended to describe how controls on the loading of e-coli to Crab Creek will ensure that the criterion is attained.

The TMDL modelers determined the fecal coliform production rates within the watershed. Data used in the model was obtained from a wide array of sources, including farm practices in the area, the amount and concentration of farm animals, animal access to the stream, wildlife in the watershed, wildlife fecal production rates, landuses, weather, stream geometry, etc.. The model combined all of the data to determine the hydrology and water quality of the stream. The lands within the watersheds were categorized into specific landuses. The landuses had specific loading rates and characteristics that were defined by the modelers. Therefore, the loading rates are different in lands defined as forested versus pasture. Pasture lands support cattle and are influenced differently by stormwater runoff.

The Crab Creek TMDL model was run using weather data collected from the NWS Station #446955 weather station in Pulaski County. This data was used to determine the precipitation rates in the watershed which transport land deposited pollutants to the stream through overland and groundwater flow. Waste that was deposited to the land or stored was subjected to a die-off rate. The longer fecal coliform stayed on the ground the greater the die-off was. Materials that were washed off the surface shortly after deposition were subjected to less die-off. The hydrology model of the TMDL was calibrated to a paired watershed (Upper Tinker Creek) that was determined to have similar hydrology to Crab Creek. This model was transferred to the Crab Creek and then calibrated for hydrologic accuracy using instantaneous flow data collected on Crab Creek at a USGS monitoring station. The water quality model for bacteria was calibrated to observed data collected from Crab Creek.

Through the development of this and other similar TMDLs, it was discovered that natural conditions (wildlife contributions to the streams) could cause or contribute to violations of the bacteria criteria. Bacteria Source Tracking (BST) sampling data collected on Crab Creek indicated that bacteria from wildlife represents a significant portion of the instream load. Many of Virginia's TMDLs, including the TMDL for Crab Creek, have called for some reduction in the amount of wildlife contributions. EPA believes that a significant reduction in wildlife is not practical and will not be necessary due to the implementation plan discussed below.

A phased implementation plan will be developed for all streams in which the TMDL calls for reductions in wildlife. In Phase 1 of the implementation, the Commonwealth will begin implementing the reductions (other than wildlife) called for in the TMDL. In Phase 2, which can occur concurrently to Phase 1, the Commonwealth will consider addressing its standards to accommodate this natural loading condition. The Commonwealth has indicated that during Phase 2, it may develop a Use Attainability Analysis (UAA) for streams with wildlife reductions which are not used for frequent bathing. Depending upon the result of the UAA, it is possible that these streams could be designated for secondary contact.

After the completion of Phase 1 of the implementation plan, the Commonwealth will monitor the stream to determine if the wildlife reductions are actually necessary, as the violation level associated with the wildlife loading may be smaller than the percent error of the model. In Phase 3, the Commonwealth will investigate the sampling data to determine if further load reductions are needed in order for these waters to attain standards. If the load reductions and/or the new application of standards allow the stream to attain standards, then no additional work is warranted. However, if standards are still not being attained after the implementation of Phases 1 and 2, further work and reductions will be warranted.

Benthic

As stated above, the biological assessments on Crab Creek were not able to discern a clear stressor to the Creek. The TMDL modelers therefore conducted a stressor identification analysis to determine what was impacting the benthic community. Ambient water quality data was able to rule out dissolved oxygen (DO), temperature, pH or toxics as the stressors to Crab Creek. Although elevated levels of nutrients were observed, this stressor was ruled out based on an analysis of the DO data and the results of a diurnal DO study, since excessive nutrient loadings to the stream were expected to manifest themselves in low DO levels which were not observed. Sediment was seen as the stressor to Crab Creek. Excessive sediment loadings can destroy critical habitat areas, clog an organisms gills and respiratory ability, and lower the instream visibility for predators. Nutrient loads to Crab Creek should be reduced by the controls placed on sediment reaching the stream. Habitat assessments on Crab Creek drew a similar conclusion with low embeddedness and riparian vegetation scores illustrating the filling of habitat areas, the smothering of the benthic community, and the source of the sediment.

The GWLF model was used to determine the loading rates of sediment to the impaired and reference stream from all point and nonpoint sources. The TMDL modelers determined the sediment loading rates within each watershed. Data used in the model was obtained on a wide array of items, including land uses in the area, point sources in the watershed, weather, stream geometry, etc..

The GWLF model provides the ability to simulate runoff and sediment loadings from watersheds given variable source areas (e.g., agricultural, forested, and developed land). GWLF is a continuous simulation model that uses daily time steps for weather data and water balance calculations.[8] To equate the reference watershed (Toms Creek) with the monitored watershed, the reference watershed was decreased in size to that of the Crab Creek in the model. Each land-use was decreased in equal proportion, insuring that the land use breakdown in the reference watershed remained constant. Local rainfall and temperature data were needed to simulate the hydrology, this data was obtained from the Blacksburg 3 SE weather station for both the Toms Creek and Crab Creek models. In the GWLF model, the nonpoint source load calculation is affected by terrain conditions, such as the amount of agricultural land, land slope, soil

[8]Ibid 1

erodibility, and farming practices used in the area.[9] Parameters within the model account for these conditions and practices. Since there were no flow gages with appropriate data for calibrating the GWLF model within the impaired and reference watersheds, the hydrology component of the model was not calibrated to observe flow data. The GWLF was developed to be used on watersheds without gage data.

2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.

Total Allowable Loads

Virginia indicates that the total allowable loading is the sum of the loads allocated to land based precipitation driven nonpoint source areas (forest and agricultural land segments) and point sources. Activities that increase the levels of bacteria and sediment to the land surface or their availability to runoff are considered flux sources. The actual value for total loading can be found in Table 1 of this document. The total allowable load is calculated on an annual basis.

Waste Load Allocations

Seventeen regulated facilities were identified as discharging to the Crab Creek Watershed. Twelve are construction stormwater discharge permits and three are industrial stormwater discharge permits. Two permits are MS4 permits including one held by the Town of Christiansburg and one held by the Virginia Department of Transportation (VDOT). None of the 17 point sources are currently permitted for fecal control in the impairment area. The only discharges with potential for significant fecal contribution are the MS4 permits. The MS4 permit for the Town of Christiansburg incorporated the load from the VDOT MS4 and was given an e-coli waste load allocation representing the nonpoint sources included under the combined MS4 permit area. For sediment, all 17 facilities were provided with waste load allocations equivalent to their current load with the exception of the MS4 permits. The MS4 permit for the Town of Christiansburg was given waste load allocations for e-coli of 3.40E+08 cfu/year and for sediment of 27.57 T/year representing nonpoint sources included in the MS4 permit. The waste load allocations for the MS4 permit held by VDOT were incorporated into the waste load allocation for Town of Christiansburg MS4 permit which was reduced by 50 percent from the current load. Table 2 lists the WLAs for the facilities within the watershed.

EPA regulations require that an approvable TMDL include individual waste load allocations (WLAs) for each point source. According to 40 CFR 122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA pursuant to 40 CFR 130.7." Furthermore,

[9]Ibid 1

EPA has authority to object to the issuance of any National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with the WLAs established for that point source.

Table 2 - WLAs for Crab Creek

Facility	Permit Number	Permit Type	E-Coli (cfu/yr)	Sediment (T/yr)
VDOT-Salem District	VAR100229	Construction Stormwater	0.0	2.54
VDOT-Christiansburg (4541)	VAR101126	Construction Stormwater	0.0	0.90
Depot Street School Residence	VAR102138	Construction Stormwater	0.0	0.27
Oaktree Townhouse Phase VI	VAR102140	Construction Stormwater	0.0	0.85
Holy Spirit Catholic Church	VAR102148	Construction Stormwater	0.0	0.30
New River Medical Assoc. Medical Office Park	VAR102164	Construction Stormwater	0.0	0.61
Edgemont of Diamond Hill	VAR102279	Construction Stormwater	0.0	5.69
Lions Gate	VAR102308	Construction Stormwater	0.0	1.61
Hunters Ridge Phase III	VAR103014	Construction Stormwater	0.0	0.33
Oak Tree Professional Park	VAR103064	Construction Stormwater	0.0	0.97
Hans Meadow Drainage Improvement	VAR103090	Construction Stormwater	0.0	0.24
Oak Tree Townhouses	VAR103349	Construction Stormwater	0.0	3.70
Town of Christiansburg	VAR051370	Industrial Stormwater	0.0	2.48
Marshall Concrete	VAG110015	Industrial Stormwater	0.0	0.59
Federal Express Corp-WALA Station	VAR520312	Industrial Stormwater	0.0	0.15
Town of Christiansburg	VAR040025	MS4	3.40E+08	27.57
VDOT (load included in Town of Christiansburg MS4)	VAR040016	MS4		

Load Allocations

According to Federal regulations at 40 CFR 130.2(g), load allocations (LAs) are best

estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible, natural and nonpoint source loads should be distinguished.

In order to accurately simulate landscape processes and nonpoint source loadings of bacteria, VADEQ used the HSPF model to represent the impaired watersheds. The HSPF model is a comprehensive modeling system for the simulation of watershed hydrology, point and nonpoint source loadings, and receiving water quality. HSPF uses precipitation data for continuous and storm event simulation to determine total loading to the impaired segments from the various land uses within the watershed.

For the sediment TMDL the GWLF model was used to ascertain the sediment loading to Crab Creek. This model provides the monthly sediment load to the stream through the use of the universal soil loss equation (USLE). The USLE derives the sediment loading by using information on precipitation rates, best management practices, land slope, and vegetative cover. Table 3a and 3b list the LAs for Crab Creek.

Table 3a - LA for Bacteria (E-coli) for Crab Creek

Source Category	Existing Load (cfu/yr)	Allocated Load (cfu/yr)	Percent Reduction
Residential	4.11E+14	2.06E+11	99.95
Commercial	1.15E+13	5.75E+09	99.95
Barren	6.72E+11	3.36E+08	99.95
Cropland	7.42E+14	3.71E+11	99.95
Livestock Access	9.18E+13	4.59E+10	99.95
Pasture	1.54E+15	7.70E+11	99.95
Forest	1.36E+14	1.36E+12	99
Water	0.00E+00	0.00E+00	0
Livestock - Direct	9.30E+14	0.00E+00	100
Wildlife - Direct	2.62E+12	2.62E+12	0
Straight Pipes and Sewer Overflows	1.52E+15	0.00E+00	100

Table 3b - LA for Sediment for Crab Creek

Source Category	Existing Load (T/yr)	Proposed Load (T/yr)	Percent Reduction
Forest	149	149	0
Pasture	1,997	548	72
Cropland	762	762	0
Transitional	31	31	0
Developed	25	25	0
Channel Erosion	4,417	923	79.1

3) The TMDLs consider the impacts of background pollution.

The TMDL considers the impact of background pollutants by considering the bacteria and sediment loadings from background sources like wildlife.

4) The TMDLs consider critical environmental conditions.

According to EPA's regulation 40 CFR 130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of Crab Creek is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[10]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum.

The HSPF and GWLF models were run over a multi-year period to insure that they accounted for a wide range of climatic conditions. The allocations developed in these TMDLs will therefore insure that the criteria are attained over a wide range of environmental conditions including wet and dry weather conditions.

5) The TMDLs consider seasonal environmental variations.

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[10]EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

Seasonal variations involve changes in stream flow and loadings as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods.

Bacteria and sediment loadings also change during the year based on crop cycles, waste application rates, vegetative cover and cattle access patterns. Consistent with the discussion regarding critical conditions, the HSPF and GWLF models and TMDL analysis effectively considered seasonal environmental variations through the use of observed weather data over an extended period of time and by modifying waste application rates, crop cycles, and livestock practices.

6) The TMDLs include a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. The MOS may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL. Virginia included an implicit MOS in the bacteria TMDL through the use of conservative modeling assumptions in the determination of bacteria loadings from point sources and the land application of biosolids. An explicit MOS for the sediment TMDL was developed by removing 10% of the loading and assigning it to the MOS.

7) There is a reasonable assurance that the TMDLs can be met.

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint Source Program. There is also overlap between the Best Management Practices (BMPs) used for reducing these pollutants. Removing the cattle from the stream will reduce both the bacteria and sediment loads to the stream.

8) The TMDLs have been subject to public participation.

During the development of the TMDL for the Crab Creek watershed, public involvement was encouraged through several meetings to discuss and disseminate the Crab Creek TMDL. A

basic description of the TMDL process and the agencies involved was presented at a kickoff meeting on May 29, 2003 at the Dublin Library in Dublin, Virginia with 24 people in attendance. The New River Roundtable Agricultural Subcommittee met on August 9, 2003. The first public meeting was held on October 14, 2003 at the Montgomery County Government Center in Christiansburg, Virginia with fifteen people in attendance. A "Field Day" was offered on November 18, 2003 to all stakeholders in the Back Creek, Crab Creek, and Peak Creek watershed areas. Nine people attended the "Field Day." The final model simulations and the TMDL load allocations were presented during the final public meeting on March 17, 2004 at the New River Valley Competitiveness Center in Radford, Virginia. Twenty-five people attended the final public meeting. The first and final public meetings were both noticed in the Virginia Register and open to a thirty-day public comment period. No written comments were received.